

APPENDIX J

SOIL LEACHING DOCUMENTATION *(Provided on CD)*

EVALUATION OF POTENTIAL LEACHING FROM OU1 SOILS TO GROUNDWATER

Note: This evaluation was prepared for the Response to Comments package previously submitted on April 3, 2012 to USEPA by AMEC Environment & Infrastructure, Inc. in behalf of Olin Corporation. No revisions or updates have been made to the actual Response to Comments submittal.

Based on a review of the surface (0-1 ft) and shallow subsurface (1-10 ft) soil and the on-Property shallow groundwater data (2007 to present) for several compounds, there appears to be little evidence of leaching from soils to groundwater at the site.

Published USEPA Leaching-based Soil Screening Levels (SSLs) will be considered supplemental information to be considered with the evaluation of a comprehensive data set of soil and shallow groundwater. The SSLs are very conservative, and assume that the potential receiving groundwater is drinking water. At OU1, only a small portion of the property has groundwater that is classified, per Massachusetts criteria, as a current or potential future drinking water resource. Only a small portion of the property (northeast corner) is located within the Zone II (zone of contribution) of the Wilmington Town Wells.

To evaluate evidence of leaching of contaminants from soil to shallow groundwater, the OU1 soil data summaries (Preliminary RI Tables 4.1-1 through 4.1-3) were compared to on-Property shallow groundwater data (2007 to present) as an initial screening step (attached Tables 1-1 through 1-3). Shallow groundwater samples were obtained from monitoring wells screened across the water table or within 5 feet of the water table (the list of shallow monitoring wells is identified in Table 1-4). The existing soil and shallow groundwater data are the best means for evaluating the current leaching to groundwater. Based on historical and most recent data, deeper groundwater has clearly been impacted most by historical liquid process waste disposal activities that occurred during facility operations prior to connection of the facility to the public sewer system in the early 1970s and prior to Olin ownership. Releases to soils during the manufacturing processes ceased in 1986 (when the facility ceased operations) or earlier. Therefore, releases to soil would have occurred at least 26 years ago.

There are fewer volatile organic and semivolatile organic compounds detected in shallow groundwater than in soil. Trimethylpentenes are the most frequently detected VOCs in both soil and groundwater. The most frequently detected semi-volatile organic compounds in shallow groundwater are bis(2-ethylhexyl)phthalate, diphenyl ether, and N-nitrosodiphenylamine. Several polycyclic aromatic hydrocarbon compounds frequently detected in surface soil samples have not been detected or have been detected in only one groundwater sample during the RI. Acetaldehyde, formaldehyde, and phthalic acid/anhydride have been detected in soil samples but not in any shallow groundwater samples.

Figures displaying contaminant distribution for on-Property shallow groundwater with soil

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contaminant distribution for several compounds were prepared to evaluate potential leaching concerns (Figures 1-1 through 1-8). Groundwater data used in these figures is the average of the two rounds of RI groundwater sampling. To facilitate review of the figures and to provide additional perspective, various process areas and waste disposal features have been outlined on each of the contaminant distribution figures. The relationship of contaminant distribution in shallow versus deeper overburden groundwater was also considered in the context of potential for leaching of contaminants from unsaturated soil to groundwater. It should be recognized that the historical liquid waste disposal activities appear to be the predominant but not the only contributors to groundwater impacts (e.g. Plant B production area TMPs and Plant B Tank Farm Area TMPs, phthalates, and processing oil).

The OU1 soil and groundwater data summaries (Tables 1-1 through 1-3) were evaluated to identify parameters that were detected frequently (greater than 5 detections) in both soil and groundwater. Based on detection frequencies and site history, contaminant distribution figures were developed for shallow subsurface soil (1-10 ft) and the corresponding shallow groundwater for the following compounds:

- total trimethylpentenes (Figure 1-1)
- bis(2-ethylhexyl)phthalate (Figure 1-2)
- n-Nitrosodiphenylamine (Figure 1-3)
- calcium (Figure 1-4)
- chromium (Figure 1-5)
- nitrogen, ammonia (Figure 1-6)
- sulfate (Figure 1-7)
- hydrazine (Figure 1-8)

Additional figures were created for surface soil (0-1 ft) and the corresponding shallow groundwater for sulfate (Figure 1-9), and shallow subsurface soil (1-10 ft) and the corresponding deep groundwater for sulfate (Figure 1-10) and chromium (Figure 1-11).

Total trimethylpentenes have shallow subsurface soil concentrations ranging from 0.001 to 1,510 mg/kg, predominantly in the areas of the Plant B Production Area and Plant B Treatment Area, Lake Poly, the Buried Debris Area, and Drum Area A (Figure 1-1). Most other areas on the northern portion of the site have no trimethylpentenes detected. Shallow groundwater detections of total trimethylpentenes are located at the Plant B Production Area and Tank Farm as well as around the Slurry Wall/Cap. The trimethylpentenes in shallow groundwater at the Plant B Production Area and Plant B Treatment Building appear to be related to releases of liquid product and processing oil containing trimethylpentenes, respectively. The trimethylpentenes in shallow groundwater samples along the perimeter of the Slurry Wall/Cap appear to be related to diffuse groundwater.

Bis(2-ethylhexyl)phthalate (BEHP) was detected at concentrations of 0.012 – 8,600

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mg/kg in shallow subsurface soil with the highest concentration in the area of the Plant B Treatment Building, Lake Poly, and the Buried Debris Area (Figure 1-2). BEHP was generally not detected in shallow groundwater samples from the former Lake Poly area. The maximum detected BEHP concentration in shallow groundwater is located in the Central Wetland (GW-17S) and is 0.00105 mg/L which does not exceed the drinking water Maximum Contaminant Level of 0.006 mg/L for bis(2-ethylhexyl)phthalate. The bis(2-ethylhexyl)phthalate in shallow groundwater at the Plant B Treatment Building appear to be related to processing oil containing bis(2-ethylhexyl)phthalate. Given the wide range of soil concentrations and the very low concentrations of BEHP in shallow groundwater, leaching of BEHP does not appear to be of concern.

N-nitrosodiphenylamine was detected in shallow groundwater in the Plant B Production Area and Plant B treatment Building area (Figure 1-3). Other than the shallow groundwater at these two Plant B areas, the shallow subsurface soil and shallow groundwater on the northern portion of the site are relatively low concentrations or non-detect. N-nitrosodiphenylamine was detected in shallow subsurface soil samples from the former Lake Poly, however, shallow groundwater concentrations in the surrounding area are relatively low or non-detect. With the exception of one soil sample in the Buried Drum Area (BD-C18 at 339 mg/kg), the samples for both shallow subsurface soil and shallow groundwater have relatively low concentrations or N-nitrosodiphenylamine is not detected for the remainder of the site, south of Lake Poly. The N-nitrosodiphenylamine in shallow groundwater at the Plant B Production Area appears to be related to releases of liquid product and possibly processing oil containing N-nitrosodiphenylamine. Given the wide range of soil concentrations and the very low concentrations of N-nitrosodiphenylamine in shallow groundwater, leaching of N-nitrosodiphenylamine does not appear to be of concern.

Chromium concentrations for shallow subsurface soil ranged from 1.8 - 7,900 mg/kg (Figure 1-5). Soil concentrations are substantially lower than the Regional Screening Levels for residential soils of 120,000 mg/kg for trivalent chromium and the risk-based SSL of 28,000.000 mg/kg. The highest shallow subsurface soil concentration of chromium is located at Lake Poly (LPB18 from 8-10 ft bgs). The maximum detected concentration for chromium in shallow groundwater was located at GW-29S in the vicinity of Lake Poly. GW-29S has previously been analyzed for both trivalent and hexavalent chromium and was found to contain trivalent chromium (0.027 mg/L) and hexavalent chromium was not detected (0.005 U mg/L). Shallow groundwater concentrations range from 0.0036 – 0.035 mg/L which are also lower than the Regional Screening Levels for tap water of 16 mg/L for trivalent chromium. Chromium concentration ranged from 0.00345 – 1,700 mg/L for deep groundwater (groundwater deeper than 5 ft below the water table). The maximum detected deep groundwater location (MP-1 #01) is located within the Slurry Wall/Cap (Figure 5-11) That location and sampling port is associated with DAPL. This location has also been analyzed previously with an indication that the chromium is considered to be trivalent chromium, total chromium was detected (1,600 mg/L) while the hexavalent chromium was non-detect

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(0.001 mg/L).

Calcium was detected in shallow groundwater at concentrations ranging from 2.05 – 250 mg/L with the highest concentration to the east of the Slurry Wall/Cap (GW-6S) (Figure 1-4). Shallow subsurface soil concentrations range from 150 – 32,000 mg/kg. Several of the higher concentration samples were collected from the shallow subsurface soil within the footprint of the two former lined lagoons (within the Slurry Wall/Cap). However, the maximum concentration in subsurface soil was in a sample from a location east of the cap (RSO-12 from 0-3 ft bgs).

Nitrogen, ammonia was detected at concentrations of 3.6 – 4,700 mg/kg in shallow subsurface soil samples, with the higher concentrations in the vicinity of Lake Poly (4,700 mg/kg at LP-BOT-C) (Figure 1-6). The northern portion of the site appears to have relatively low concentrations of nitrogen, ammonia in both soil and shallow groundwater. Shallow groundwater concentrations are elevated (65 – 165 mg/L) south of the Slurry Wall/Cap structure. Groundwater on the southern portion of the site are elevated likely due to the continuing effects of the diffuse groundwater present prior to the installation of the Slurry Wall/Cap.

The highest concentration of sulfate in surface soil samples was detected within the Slurry Wall/Cap (CPDA-2 at 26,800 mg/kg) (Figure 1-9). However, there are also substantial concentrations reported in the Central Pond area (CPDA-8 at 23,900 mg/kg) and east of the Plant D Tank Farm (SWMU-26 at 19,400 mg/kg). Surface soil, shallow subsurface soil and shallow groundwater sulfate concentrations on the northern portion of the site are relatively low or sulfate was not detected. Sulfate was detected in shallow subsurface soil samples within the Slurry Wall/Cap, however the location of maximum detection was located within the West Warehouse at location E1.40 (285,000 mg/kg) (Figure 1-7). However, sulfate concentrations in shallow groundwater samples do not appear to be elevated in this area. Sulfate concentrations in shallow groundwater samples from the Slurry Wall/Cap area and in the southern portion of the site range from 45 – 1,035 mg/L. These concentrations are likely due to the continuing effects of the diffuse groundwater present prior to the installation of the Slurry Wall/Cap. Sulfate concentrations in deep groundwater (Figure 1-10) are extremely high within the multilevel piezometer located in the Slurry Wall/Cap at 72,000 mg/L in MP-1 at the deepest port (DAPL sample) and range from 278 – 2,950 mg/L to the south and east.

Calcium, sulfate, and nitrogen, ammonia have similar distributions in shallow groundwater. Higher concentrations in shallow groundwater in the southern half of the property appear to be related to those areas that were downgradient of the DAPL pool prior to the installation of the Slurry Wall/Cap. Those areas exhibit residual DAPL/diffuse groundwater parameters.

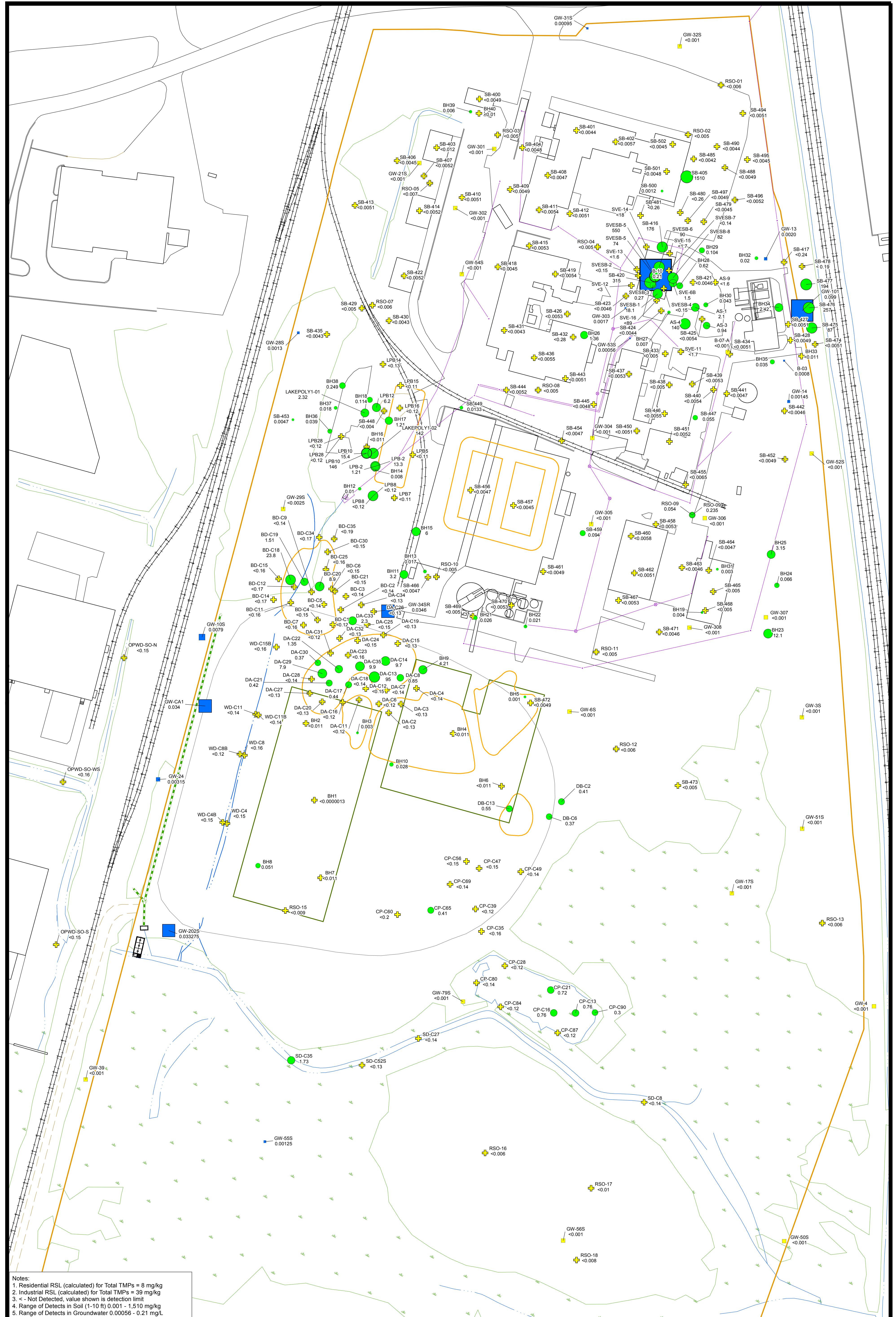
Hydrazine was detected at a concentration of 1.9 mg/kg in a shallow subsurface soil sample collected from Lake Poly (LPB-48) at a depth of 5-8 ft bgs (Figure 1-8). The only

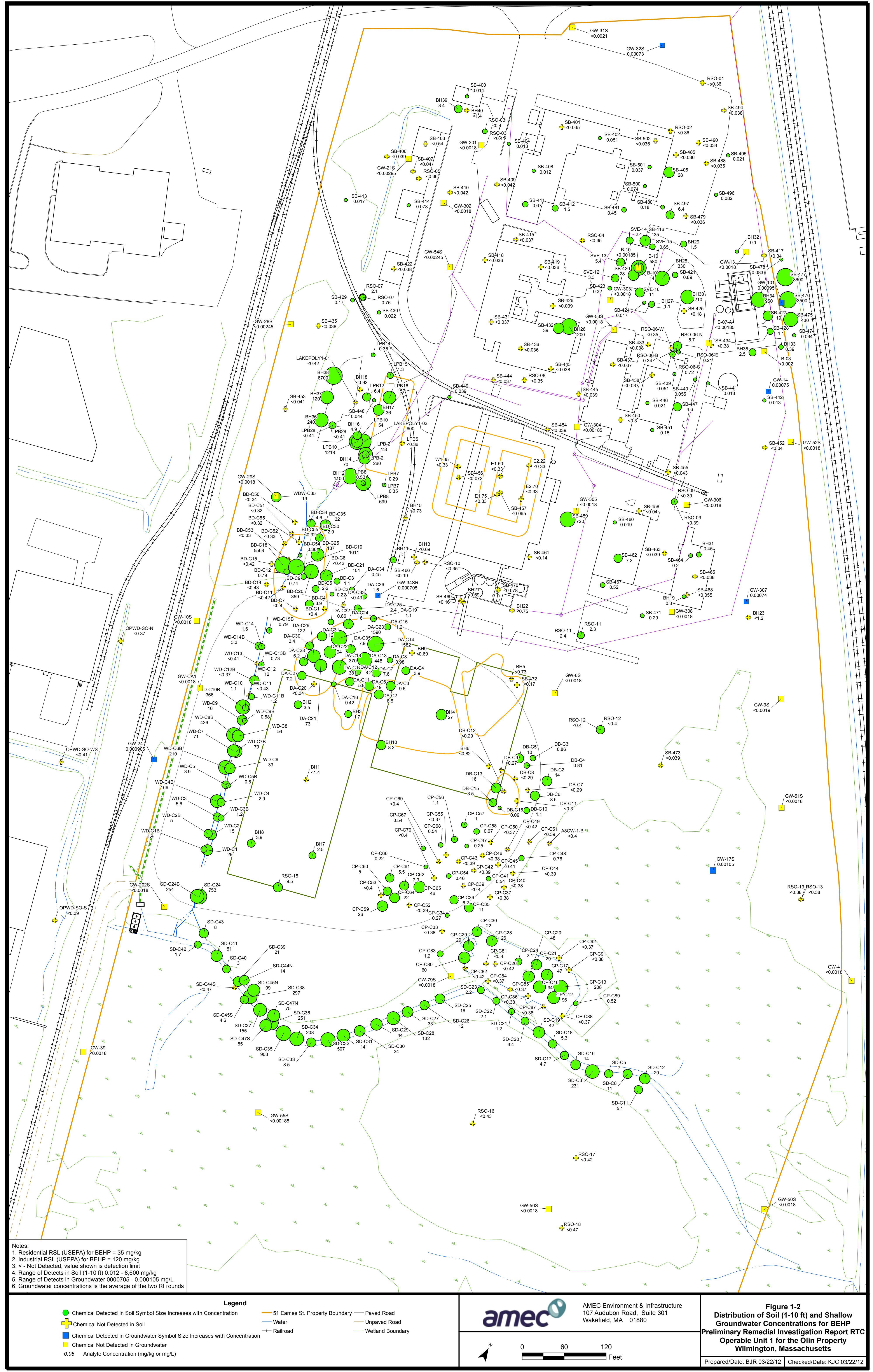
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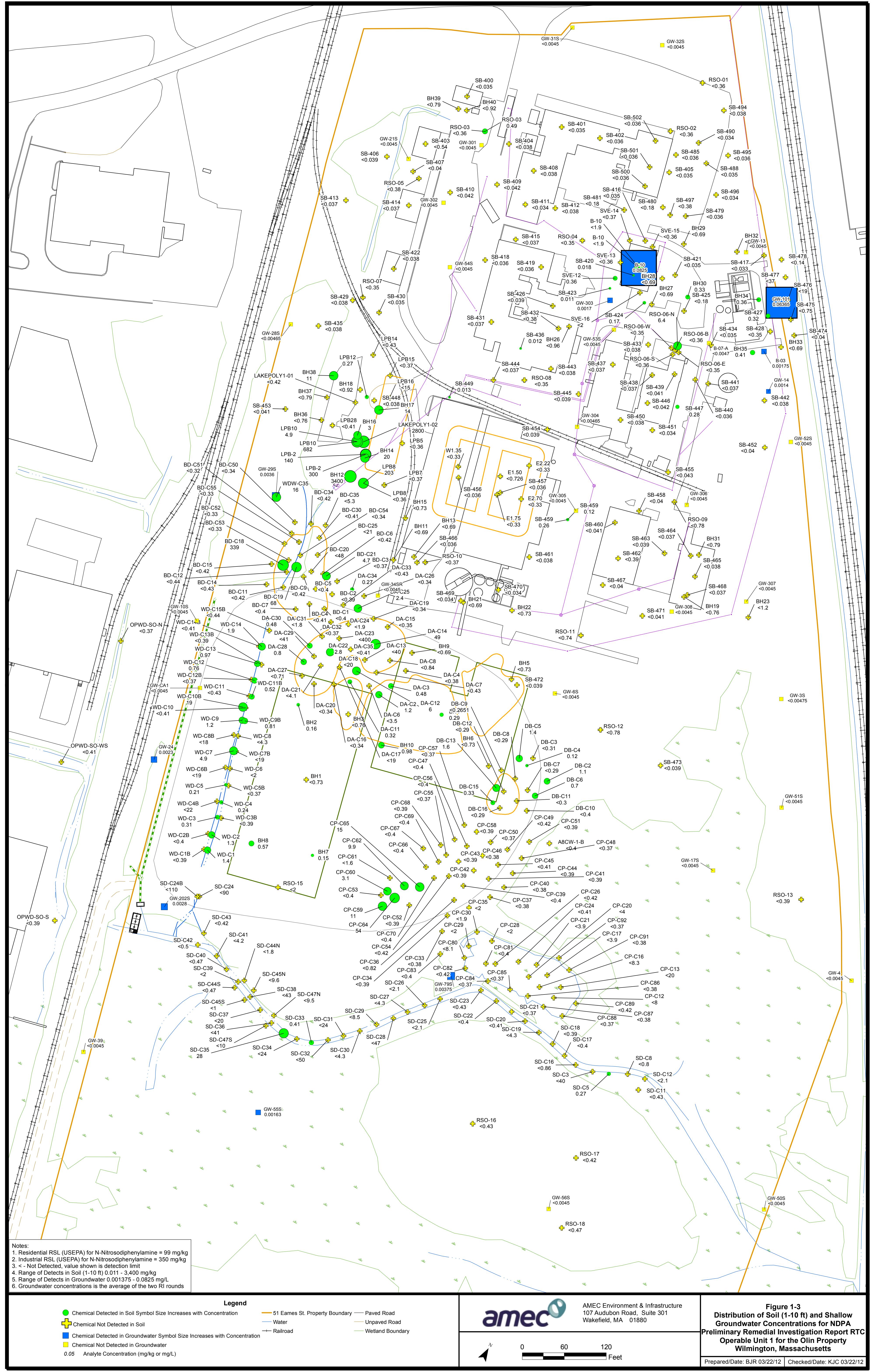
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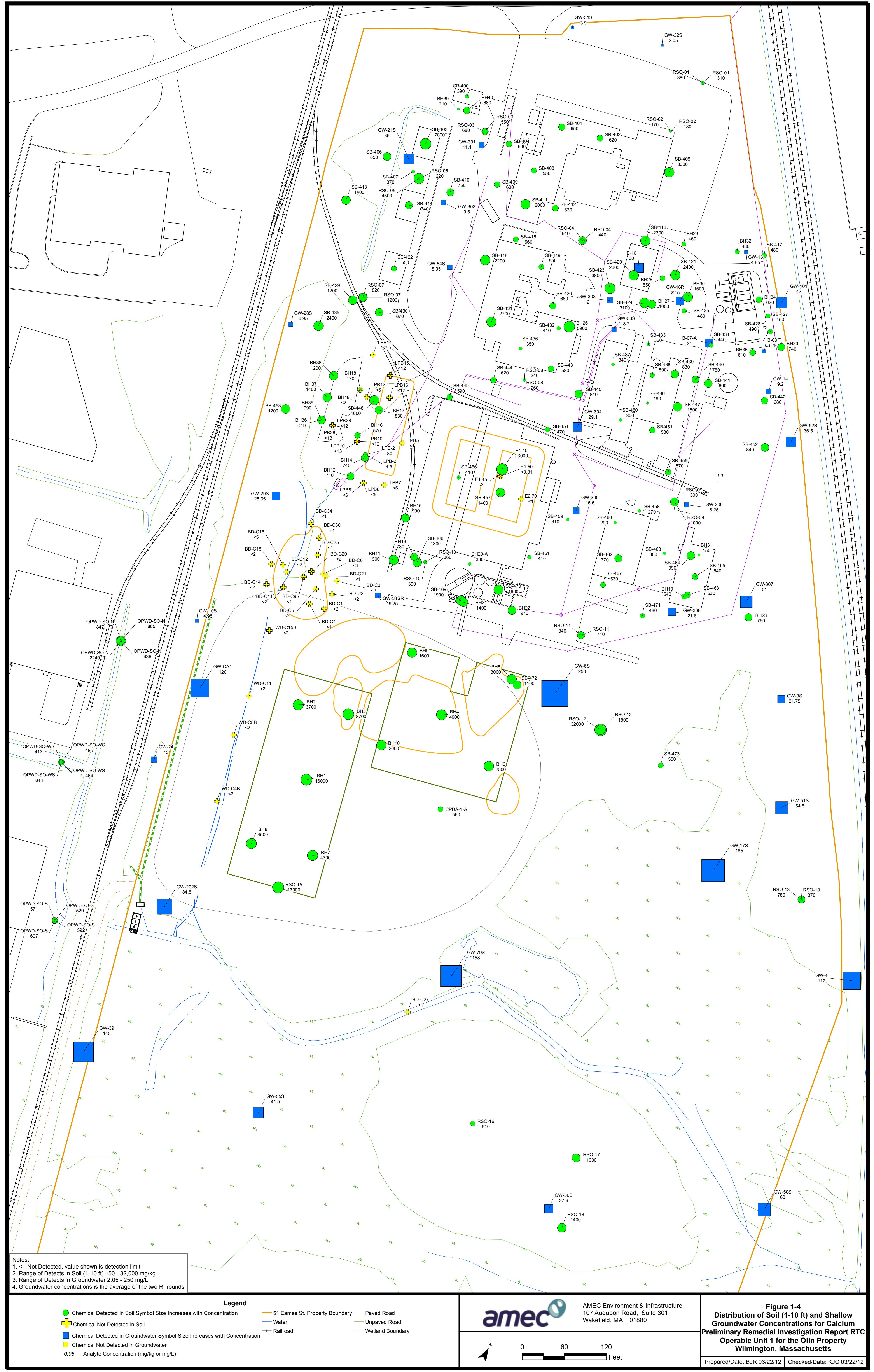
other detection of hydrazine in Lake Poly is two orders of magnitude lower (0.0013 mg/kg at SB-448 from 8-10 ft bgs). Hydrazine was not detected in shallow groundwater samples collected northwest and south of the former Lake Poly. The Plant D Tank Farm has an area of hydrazine detections in the shallow subsurface soil ranging from 0.0023 to 0.42 mg/kg which appears to be co-located with the hydrazine detections in shallow groundwater at GW-307 (0.175 mg/L) and GW-308 (0.001665 mg/L). This is suggestive of potential limited localized leaching of hydrazine from soil to groundwater.

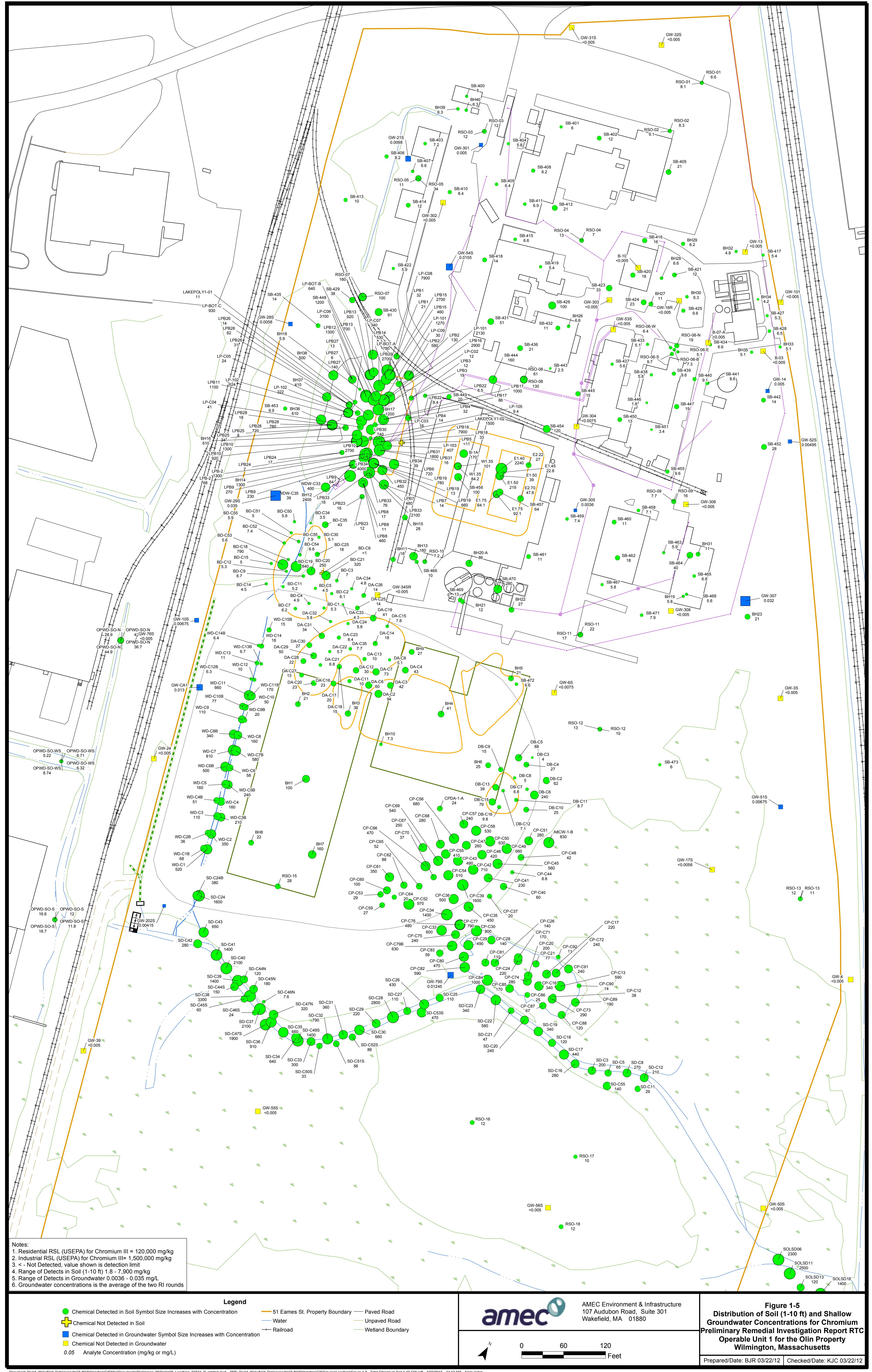
Some parameters in DAPL and diffuse groundwater may be associated with dissolution of soil or rock material due to the low pH of the DAPL. In some cases, these parameters may be detected in shallow groundwater that is impacted by diffuse material. The Slurry Wall/Cap was installed in 2000, however, diffuse groundwater existing prior to the installation of the Slurry Wall/Cap may have an impact on this area.

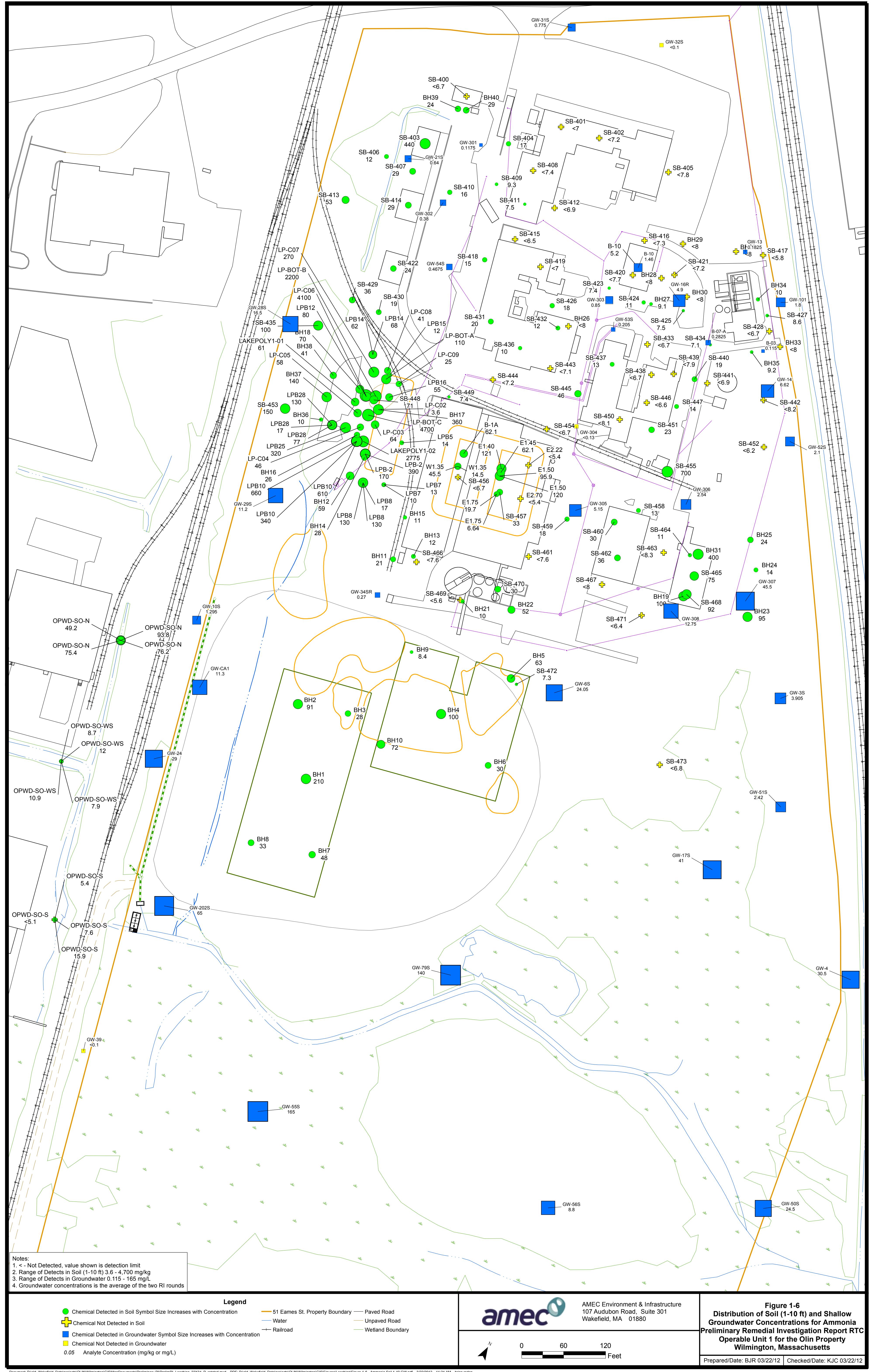


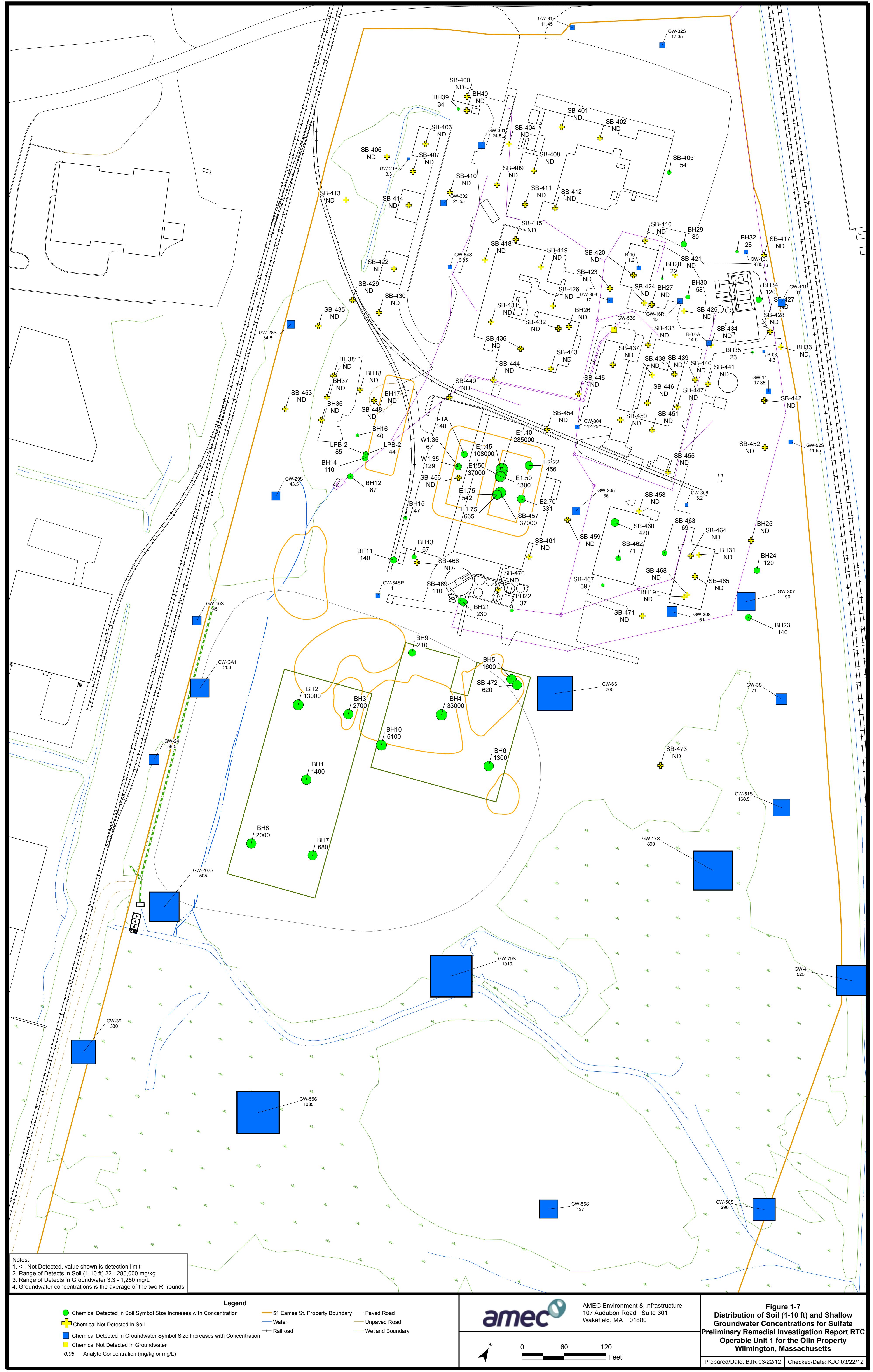


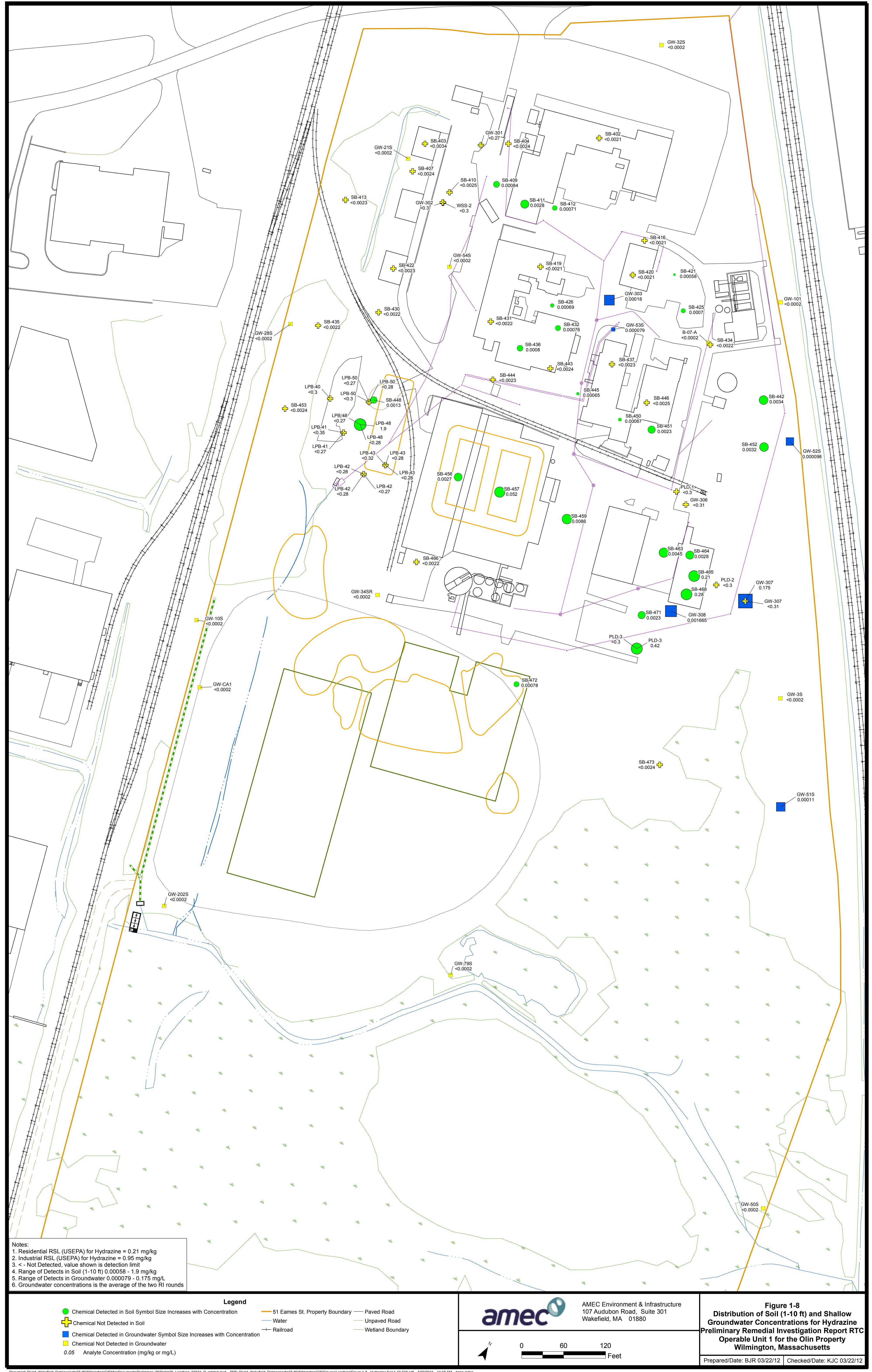


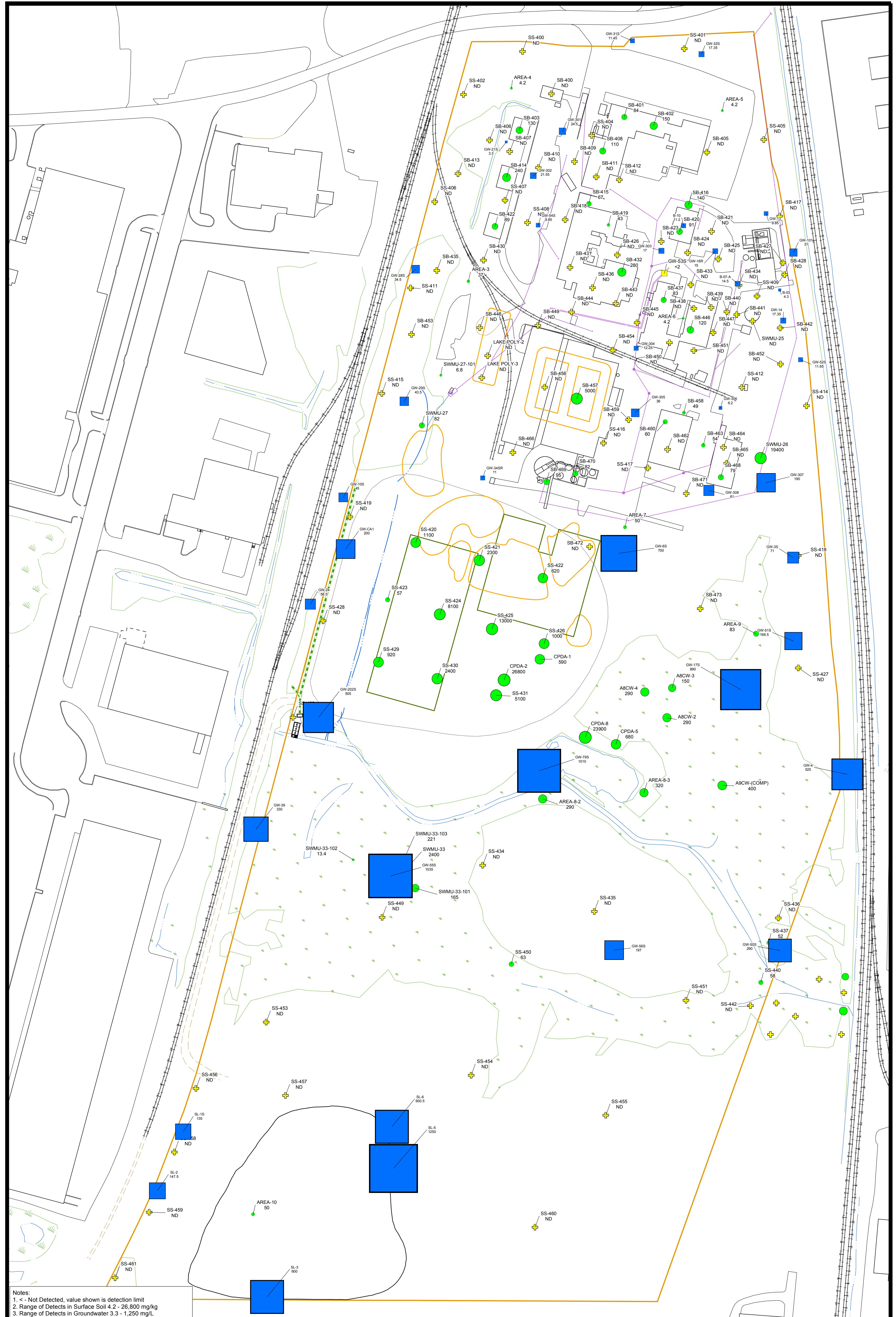











Legend

- Chemical Detected in Soil Symbol Size Increases with Concentration
- ✚ Chemical Not Detected in Soil
- Chemical Detected in Groundwater Symbol Size Increases with Concentration
- Chemical Not Detected in Groundwater
- 0.05 Analyte Concentration (mg/kg or mg/L)
- 51 Eames St. Property Boundary
- Paved Road
- Water
- Unpaved Road
- Railroad
- Wetland Boundary

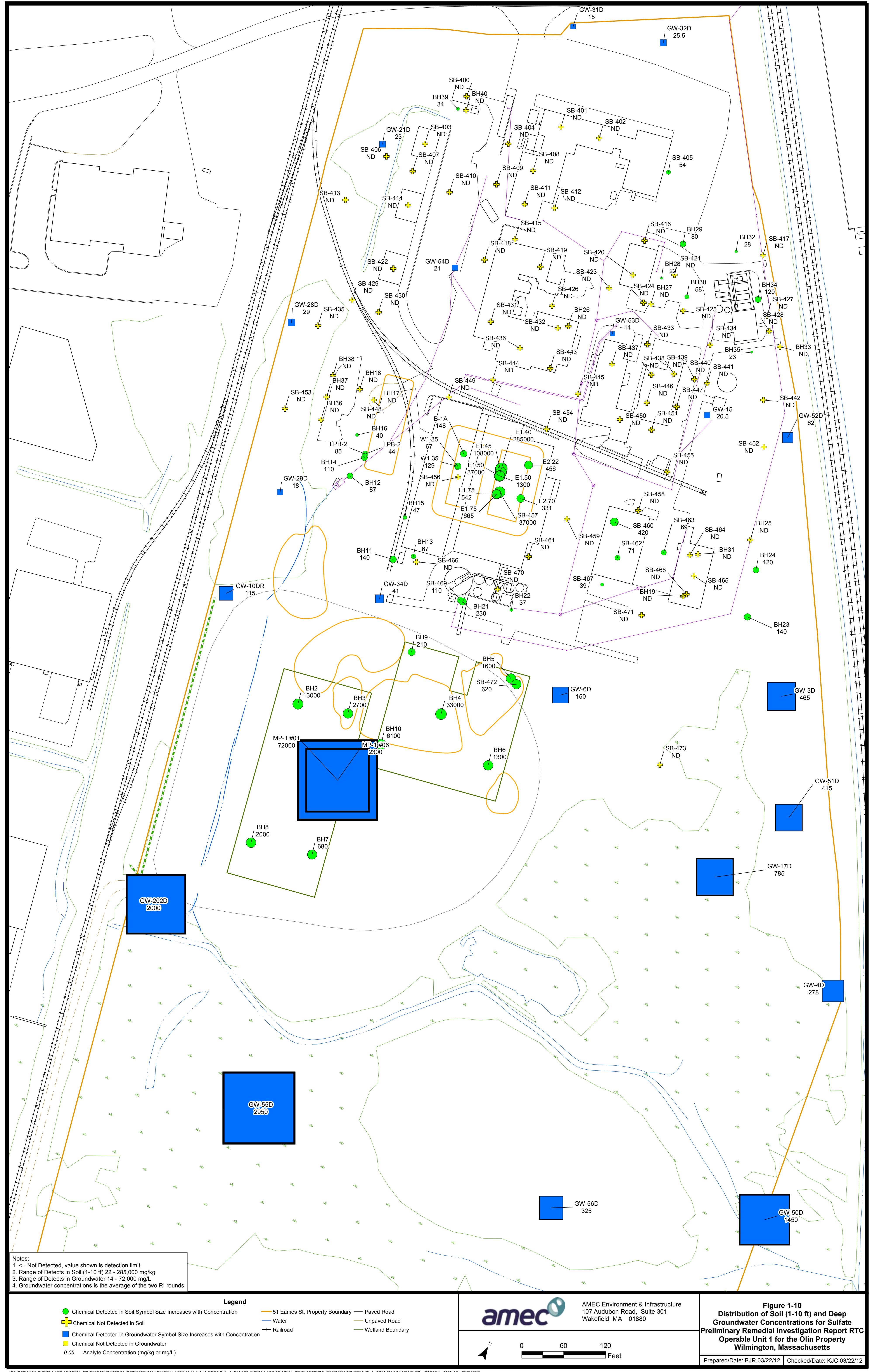


AMEC Environment & Infrastructure
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Feet

Figure 1-9
Distribution of Surface Soil and Shallow Groundwater Concentrations for Sulfate
Preliminary Remedial Investigation Report RTC
Operable Unit 1 for the Olin Property
Wilmington, Massachusetts

Prepared/Date: BJR 03/22/12 Checked/Date: KJC 03/22/12



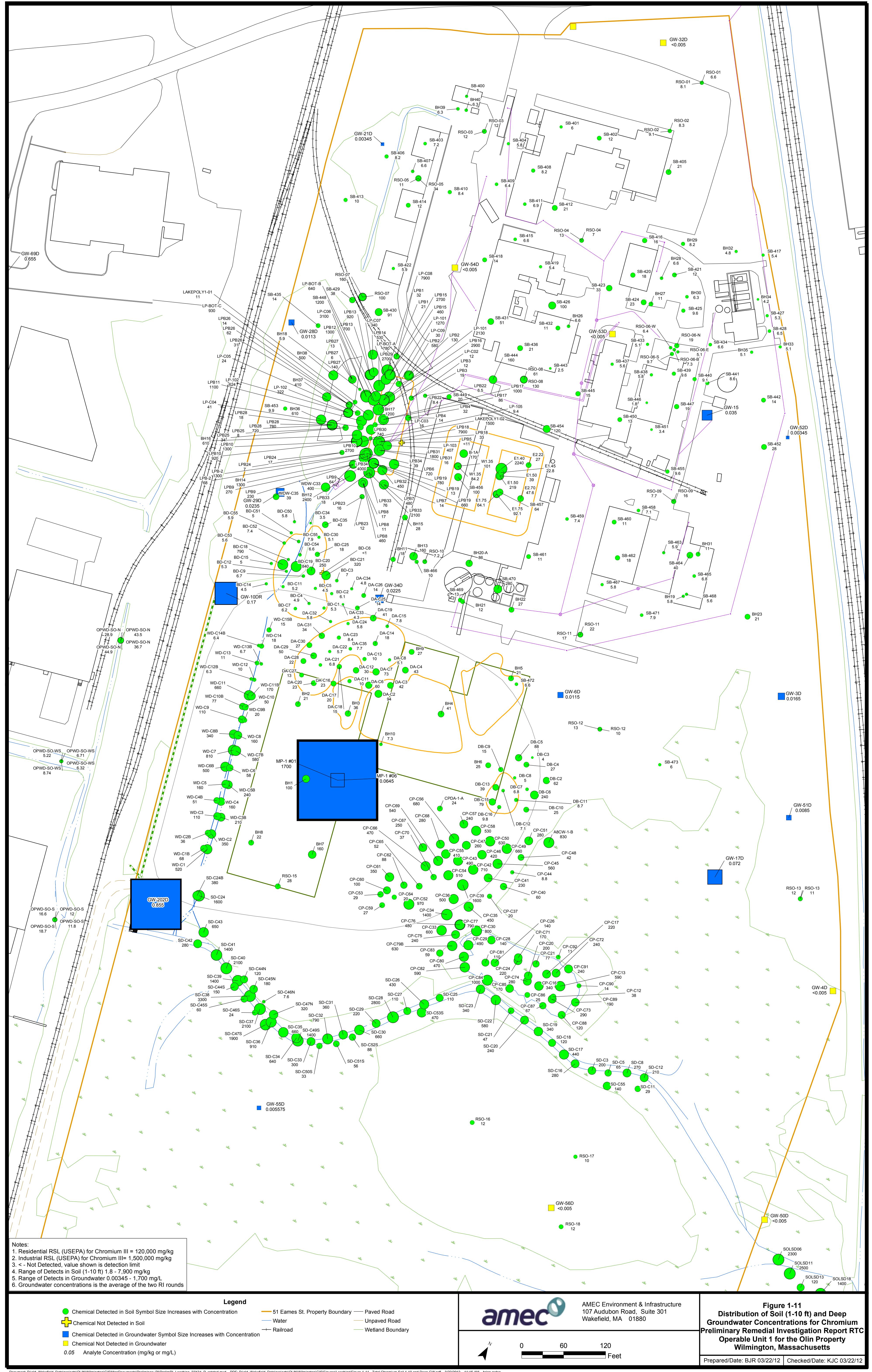


Table 1-1
Summary of Detected Chemicals for Surface Soil Samples (0-1 ft) and On-Property Shallow Groundwater
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	Surface Soil (0-1 ft bgs) (mg/Kg)				On-Property Shallow Groundwater (mg/L)			
	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
Volatile Organics								
1,1,1-Trichloroethane	8 / 201	0.0022 : 1	0.003 - 0.071	0.031	1 / 79	0.001 : 0.004	0.0004 - 0.0004	0.00054
2,4,4-Trimethyl-1-pentene	7 / 196	0.0044 : 0.79	0.002 - 2.1	0.049	40 / 112	0.001 : 0.01	0.00074 - 1.7	0.18
2,4,4-Trimethyl-2-Pentene	6 / 197	0.0044 : 0.79	0.0056 - 0.61	0.032	34 / 112	0.001 : 0.01	0.00043 - 0.49	0.050
Acetone	16 / 201	0.006 : 20	0.011 - 0.093	0.84	1 / 79	0.05 : 0.2	0.03 - 0.03	0.027
Methylene chloride	11 / 201	0.004 : 2	0.002 - 0.44	0.062	2 / 79	0.002 : 0.002	0.0078 - 0.019	0.0013
Tetrachloroethene	5 / 201	0.0022 : 1	0.001 - 0.073	0.031	0 / 79	0.001 : 0.004		0.00054
Toluene	10 / 201	0.0022 : 1	0.0009 - 0.038	0.031	1 / 79	0.001 : 0.004	0.00021 - 0.00021	0.00053
Semivolatile Organics								
1-Methylnaphthalene	7 / 130	0.033 : 17	0.023 - 0.62	0.16	1 / 79	0.0045 : 0.005	0.000047 - 0.000047	0.0022
2-Methylnaphthalene	11 / 219	0.033 : 36	0.007 - 0.71	0.67	0 / 79	0.00091 : 0.001		0.00046
Acenaphthene	5 / 217	0.033 : 36	0.12 - 4.8	0.70	0 / 79	0.00091 : 0.001		0.00046
Acenaphthylene	10 / 219	0.033 : 36	0.008 - 0.21	0.66	0 / 79	0.00027 : 0.0003		0.00014
Acetophenone	12 / 135	0.033 : 17	0.011 - 0.17	0.18	0 / 79	0.0045 : 0.005		0.0023
Aniline	5 / 187	0.033 : 180	0.016 - 0.69	2.8	1 / 79	0.0045 : 0.005	0.0011 - 0.0011	0.0023
Anthracene	14 / 218	0.033 : 36	0.005 - 9.1	0.72	0 / 79	0.00091 : 0.001		0.00046
Benzaldehyde	41 / 130	0.033 : 17	0.012 - 1.9	0.20	0 / 79	0.0045 : 0.005		0.0023
Benzo(a)anthracene	47 / 218	0.033 : 36	0.008 - 28	0.93	0 / 79	0.00027 : 0.0003		0.00014
Benzo(a)pyrene	54 / 217	0.033 : 36	0.011 - 21	0.87	1 / 79	0.00018 : 0.0002	0.00015 - 0.00015	0.000091
Benzo(b)fluoranthene	60 / 218	0.033 : 36	0.013 - 29	0.92	1 / 79	0.00027 : 0.0003	0.0003 - 0.0003	0.00014
Benzo(ghi)perylene	34 / 217	0.033 : 36	0.014 - 16	0.80	3 / 79	0.00045 : 0.0005	0.00019 - 0.00028	0.00023
Benzo(k)fluoranthene	35 / 217	0.033 : 36	0.011 - 12	0.78	0 / 79	0.00027 : 0.0003		0.00014
Benzoic Acid	30 / 190	0.17 : 180	0.025 - 34	3.8	6 / 44	0.0045 : 0.005	0.00064 - 0.0017	0.0021
Biphenyl	8 / 129	0.033 : 17	0.023 - 0.86	0.17	4 / 79	0.0045 : 0.005	0.00049 - 0.0045	0.0022
Bis(2-Ethylhexyl)phthalate	168 / 220	0.034 : 9.1	0.011 - 5500	33	15 / 112	0.0018 : 0.0052	0.00043 - 0.012	0.0013
Butylbenzylphthalate	8 / 217	0.033 : 36	0.029 - 2.6	0.69	0 / 79	0.0045 : 0.005		0.0023
Carbazole	8 / 132	0.033 : 17	0.02 - 5.4	0.21	0 / 79	0.0045 : 0.005		0.0023
Chrysene	66 / 218	0.033 : 36	0.011 - 26	0.92	2 / 79	0.00091 : 0.001	0.00015 - 0.00031	0.00045
Dibenz(a,h)anthracene	16 / 216	0.033 : 36	0.015 - 4.8	0.72	4 / 79	0.00045 : 0.0005	0.000066 - 0.0003	0.00022
Dibenzofuran	11 / 218	0.033 : 36	0.016 - 1.7	0.70	0 / 79	0.0045 : 0.005		0.0023
Diethylphthalate	9 / 217	0.021 : 36	0.013 - 0.085	0.66	0 / 79	0.0045 : 0.005		0.0023
Di-n-butylphthalate	21 / 217	0.033 : 36	0.009 - 10	0.63	4 / 79	0.0045 : 0.005	0.00067 - 0.00085	0.0022
Diphenyl ether	19 / 129	0.033 : 17	0.011 - 1.7	0.20	24 / 79	0.0045 : 0.005	0.00052 - 0.14	0.0059
Diphenylamine	17 / 55	0.033 : 17	0.0023 - 5	0.33	3 / 48	0.0045 : 0.005	0.00056 - 0.0024	0.0022
Fluoranthene	90 / 219	0.033 : 36	0.01 - 73	1.2	2 / 79	0.00091 : 0.001	0.00023 - 0.0006	0.00046
Fluorene	11 / 217	0.033 : 36	0.008 - 3.5	0.70	0 / 79	0.00091 : 0.001		0.00046
Indeno(1,2,3-cd)pyrene	42 / 216	0.033 : 36	0.011 - 14	0.79	5 / 79	0.00045 : 0.0005	0.00012 - 0.00028	0.00022
Naphthalene	18 / 219	0.08 : 41	0.008 - 0.96	0.80	0 / 79	0.005 : 0.02		0.0027
N-Nitrosodiphenylamine	38 / 218	0.033 : 36	0.012 - 32	0.77	41 / 112	0.0045 : 0.0051	0.0005 - 0.58	0.065
Phenanthrene	64 / 219	0.04 : 36	0.011 - 35	0.92	3 / 79	0.00018 : 0.0002	0.000084 - 0.00028	0.000093
Phenol	9 / 218	0.033 : 36	0.014 - 32	0.83	2 / 78	0.0045 : 0.005	0.00067 - 0.0014	0.0022
Pyrene	87 / 218	0.033 : 36	0.011 - 29	0.84	2 / 79	0.0045 : 0.005	0.00024 - 0.00032	0.0022
Pesticides/PCBs								
4,4'-DDD	9 / 56	0.0033 : 0.21	0.00012 - 0.16	0.019				
4,4'-DDE	14 / 56	0.0033 : 0.21	0.00053 - 0.049	0.017				
4,4'-DDT	24 / 56	0.0033 : 0.21	0.0014 - 0.68	0.035				
Dieldrin	8 / 56	0.0033 : 0.68	0.00055 - 0.0025	0.022				
Gamma-BHC/Lindane	8 / 56	0.0017 : 0.21	0.00011 - 0.14	0.020				

Table 1-1
Summary of Detected Chemicals for Surface Soil Samples (0-1 ft) and On-Property Shallow Groundwater
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	Surface Soil (0-1 ft bgs) (mg/Kg)				On-Property Shallow Groundwater (mg/L)			
	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
Inorganics								
Aluminum	158 / 158		640 - 59000	6868	82 / 114	0.1 : 0.5	0.015 - 17	0.56
Antimony	9 / 144	0.53 : 20	0.28 - 79	2.2	8 / 81	0.006 : 0.03	0.0015 - 0.0026	0.0034
Arsenic	161 / 178	0.9 : 37	1.3 - 56	8.2	35 / 81	0.001 : 0.05	0.00034 - 0.026	0.0028
Barium	164 / 164		3.4 - 130	24	79 / 81	0.01 : 0.042	0.0039 - 0.21	0.032
Beryllium	119 / 145	0.18 : 1.5	0.029 - 4	0.33	15 / 81	0.001 : 0.005	0.00019 - 0.0028	0.00060
Cadmium	121 / 185	0.18 : 4	0.026 - 5.8	0.38	20 / 81	0.001 : 0.005	0.00014 - 0.0053	0.00062
Calcium	146 / 146		68 - 35000	3511	114 / 114		1.6 - 600	138
Chromium	257 / 259	5 : 10	1.1 - 62000	1245	23 / 114	0.005 : 0.025	0.00097 - 0.065	0.005
Chromium, Hexavalent	13 / 34	1.1 : 110	0.41 - 1100	43	5 / 49	0.001 : 0.001	0.00065 - 0.0016	0.00054
Cobalt	143 / 146	0.24 : 5.4	0.16 - 45	3.9	32 / 81	0.01 : 0.05	0.0015 - 0.04	0.008
Copper	146 / 146		0.94 - 190	14.9	16 / 81	0.01 : 0.065	0.0019 - 0.33	0.012
Iron	158 / 158		81 - 100000	9618	96 / 118	0.1 : 0.5	0.022 - 35	4.7
Lead	182 / 186	5 : 11	1.1 - 210	23	15 / 81	0.005 : 0.025	0.0014 - 0.0088	0.0030
Magnesium	146 / 146		24 - 6000	1437	81 / 81		0.11 - 18	3.0
Manganese	146 / 146		2.8 - 970	89	112 / 114	0.01 : 0.01	0.0027 - 7.3	1.0
Mercury	68 / 176	0.04 : 0.76	0.01 - 3.1	0.16	7 / 81	0.0002 : 0.00034	0.00012 - 0.0003	0.00011
Nickel	145 / 146	5 : 5	0.66 - 76	10.1	65 / 114	0.01 : 0.05	0.0012 - 0.045	0.0063
Potassium	140 / 146	620 : 2100	46.3 - 3400	766	55 / 81	4 : 8	0.81 - 10	2.7
Selenium	7 / 173	0.5 : 20	0.64 - 3.6	0.85	2 / 81	0.01 : 0.05	0.0039 - 0.0041	0.0058
Silver	57 / 161	0.2 : 21	0.064 - 1100	7.9	1 / 81	0.005 : 0.025	0.0027 - 0.0027	0.0029
Sodium	90 / 144	110 : 1100	15 - 2300	133	114 / 114		0.85 - 200	20
Thallium	8 / 145	0.35 : 6.5	0.09 - 7.4	0.83	3 / 81	0.0001 : 0.001	0.00021 - 0.00034	0.00048
Tin	106 / 116	5.4 : 7.5	1 - 26000	242	1 / 81	0.05 : 0.25	0.027 - 0.027	0.029
Vanadium	146 / 146		3.6 - 240	19.5	35 / 81	0.01 : 0.02	0.0017 - 0.28	0.013
Zinc	141 / 146	11 : 27	1.2 - 650	38	42 / 81	0.05 : 0.25	0.0075 - 1.2	0.075
Chloride	19 / 130	15 : 81	25 - 560	27	280 / 280		1.1 - 510	54
Cyanide, Total	7 / 15	2 : 2	3.7 - 9.7	3.6				
Nitrogen, as Ammonia	134 / 152	5.7 : 8.4	6.8 - 2100	151	255 / 279	0.1 : 1	0.16 - 380	57
Sulfate	58 / 143	31 : 210	4.2 - 26800	843	276 / 280	2 : 2	2.1 - 2100	481
EPH								
C11-C22 Aromatics	31 / 43	3.4 : 3.7	4.5 - 7500	287	2 / 4	0.091 : 0.091	0.12 - 0.43	0.16
C11-C22 Aromatics (unadj.)	31 / 43	3.4 : 3.7	4.5 - 13000	594	2 / 4	0.091 : 0.091	0.12 - 0.43	0.16
C19-C36 Aliphatics	25 / 43	3.4 : 350	3.6 - 4900	181	0 / 4	0.091 : 0.095		0.046
C9-C18 Aliphatics	9 / 43	3.3 : 350	3.6 - 780	31	0 / 4	0.091 : 0.095		0.046
Extractable Petroleum Hydrocarbons, Total	31 / 43	3.4 : 3.7	4.7 - 13000	483	2 / 4	0.091 : 0.091	0.12 - 0.43	0.16
Specialty Compounds								
Hydrazine	16 / 58	0.002 : 0.28	0.00062 - 0.27	0.022	11 / 49	0.0002 : 0.00022	0.000057 - 0.23	0.0073
Acetaldehyde	17 / 58	0.2 : 1.1	0.032 - 0.2	0.10	0 / 49	0.03 : 0.03		0.015
Formaldehyde	55 / 58	0.1 : 0.11	0.096 - 1.3	0.29	0 / 49	0.03 : 0.03		0.015
Phthalic Acid/Phthalic anhydride	10 / 57	0.096 : 0.56	0.022 - 29	0.62	0 / 49	0.01 : 0.01		0.0050

mg/Kg = milligrams per kilogram

mg/L = milligrams per liter

Shading indicates compound not analyzed for in specified media.

Prepared by / Date: KJC 02/10/12
 Checked by / Date: MJM 03/21/12

Table 1-2
Summary of Detected Chemicals for Shallow Subsurface Soil Samples (1-10 ft) and On-Property Shallow Groundwater
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	Shallow Subsurface Soil (1-10 ft bgs) (mg/Kg)				On-Property Shallow Groundwater (mg/l)			
	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
Volatile Organics								
1,2,4-Trichlorobenzene	5 / 215	0.002 : 11	0.0016 - 1.2	0.085	1 / 79	0.001 : 0.004	0.0007 - 0.0007	0.00054
1,2,4-Trimethylbenzene	7 / 215	0.002 : 11	0.13 - 4.6	0.13	2 / 79	0.001 : 0.004	0.00027 - 0.00049	0.000534937
1,3,5-Trimethylbenzene	6 / 215	0.002 : 11	0.085 - 2.9	0.11	0 / 79	0.001 : 0.004		0.00054
2,4,4-Trimethyl-1-pentene	73 / 263	0.0000013 : 0.28	0.002 - 1200	12	40 / 112	0.001 : 0.01	0.00074 - 1.7	0.18
2,4,4-Trimethyl-2-Pentene	62 / 260	0.0000013 : 0.28	0.001 - 310	3	34 / 112	0.001 : 0.01	0.00043 - 0.49	0.050
2-Butanone	17 / 281	0.01 : 110	0.0006 - 0.49	0.8	0 / 79	0.01 : 0.04		0.0054
2-Hexanone	10 / 281	0.01 : 110	0.001 - 3.8	0.4	0 / 79	0.01 : 0.04		0.0054
4-iso-Propyltoluene	14 / 215	0.002 : 11	0.12 - 18	0.28	1 / 79	0.001 : 0.004	0.00037 - 0.00037	0.00054
Acetone	21 / 281	0.01 : 1100	0.016 - 17	3.3	1 / 79	0.05 : 0.2	0.03 - 0.03	0.027
Benzene	6 / 281	0.002 : 11	0.0005 - 0.1	0.1	1 / 79	0.001 : 0.004	0.00023 - 0.00023	0.00053
Carbon disulfide	7 / 188	0.0021 : 11	0.001 - 0.013	0.1	9 / 79	0.01 : 0.04	0.00042 - 0.01	0.0049
Ethyl benzene	14 / 281	0.002 : 11	0.002 - 6.7	0.1	2 / 79	0.001 : 0.004	0.0031 - 0.013	0.00073
Formaldehyde	17 / 27	0.11 : 0.13	0.13 - 1.2	0.24	0 / 49	0.03 : 0.03		0.015
Isopropylbenzene	5 / 215	0.002 : 11	0.22 - 0.65	0.082	0 / 79	0.001 : 0.004		0.00054
Methylene chloride	49 / 281	0.005 : 46	0.002 - 2	0.2	2 / 79	0.002 : 0.002	0.0078 - 0.019	0.0013
Styrene	9 / 281	0.002 : 11	0.0005 - 3.3	0.1	1 / 79	0.001 : 0.004	0.00021 - 0.00021	0.00053
Tetrachloroethene	6 / 281	0.002 : 11	0.0008 - 0.014	0.1	0 / 79	0.001 : 0.004		0.00054
Toluene	38 / 281	0.002 : 11	0.0006 - 13	0.2	1 / 79	0.001 : 0.004	0.00021 - 0.00021	0.00053
Xylene, m/p	7 / 207	0.004 : 23	0.00094 - 0.5	0.12	0 / 79	0.002 : 0.008		0.0011
Xylene, o	5 / 207	0.002 : 11	0.042 - 0.53	0.082	0 / 79	0.001 : 0.004		0.00054
Xylenes, Total	12 / 281	0.004 : 23	0.00094 - 0.88	0.1				
Semivolatile Organics								
1,2,4-Trichlorobenzene	5 / 396	0.033 : 670	0.075 - 0.9	3.7	1 / 79	0.001 : 0.004	0.0007 - 0.0007	0.00054
Anthracene	5 / 396	0.033 : 670	0.012 - 7.6	3.7	0 / 79	0.00091 : 0.001		0.00046
Benzo(a)anthracene	9 / 396	0.033 : 670	0.02 - 18	3.7	0 / 79	0.00027 : 0.0003		0.00014
Benzo(a)pyrene	7 / 396	0.033 : 670	0.019 - 23	3.7	1 / 79	0.00018 : 0.0002	0.00015 - 0.00015	0.000091
Benzo(b)fluoranthene	11 / 395	0.033 : 670	0.029 - 17	3.7	1 / 79	0.00027 : 0.0003	0.0003 - 0.0003	0.00014
Benzoic Acid	16 / 360	0.17 : 2000	0.022 - 2.1	15.4	6 / 44	0.0045 : 0.005	0.00064 - 0.0017	0.0021
Biphenyl	5 / 92	0.033 : 37	0.017 - 0.77	0.35	4 / 79	0.0045 : 0.005	0.00049 - 0.0045	0.0022
Bis(2-Ethylhexyl)phthalate	256 / 396	0.034 : 1.4	0.012 - 8600	120	15 / 112	0.0018 : 0.0052	0.00043 - 0.012	0.0013
Butylbenzylphthalate	14 / 396	0.033 : 670	0.014 - 4.5	3.7	0 / 79	0.0045 : 0.005		0.0023
Chrysene	10 / 396	0.033 : 670	0.012 - 18	3.7	2 / 79	0.00091 : 0.001	0.00015 - 0.00031	0.00045
Di-n-butylphthalate	24 / 396	0.033 : 670	0.032 - 507	5.3	4 / 79	0.0045 : 0.005	0.00067 - 0.00085	0.0022
Di-n-octylphthalate	18 / 396	0.033 : 670	0.014 - 12	3.7	0 / 79	0.0045 : 0.005		0.0023
Diphenyl ether	7 / 92	0.033 : 37	0.03 - 3.8	0.44	24 / 79	0.0045 : 0.005	0.00052 - 0.14	0.0059
Diphenylamine	6 / 45	0.034 : 0.54	0.022 - 0.25	0.044	3 / 48	0.0045 : 0.005	0.00056 - 0.0024	0.0022
Fluoranthene	14 / 396	0.033 : 670	0.015 - 37	3.8	2 / 79	0.00091 : 0.001	0.00023 - 0.0006	0.00046
Indeno(1,2,3-cd)pyrene	8 / 396	0.033 : 670	0.012 - 10	3.7	5 / 79	0.00045 : 0.0005	0.00012 - 0.00028	0.00022
Naphthalene	8 / 396	0.08 : 670	0.012 - 0.63	3.8	0 / 79	0.005 : 0.02		0.0027
N-Nitrosodiphenylamine	73 / 396	0.033 : 400	0.011 - 3400	23	41 / 112	0.0045 : 0.0051	0.0005 - 0.58	0.065
Phenanthrene	16 / 396	0.04 : 670	0.015 - 33	3.8	3 / 79	0.00018 : 0.0002	0.000084 - 0.00028	0.000093
Phenol	9 / 396	0.033 : 670	0.055 - 6.6	3.7	2 / 78	0.0045 : 0.005	0.00067 - 0.0014	0.0022
Pyrene	20 / 396	0.033 : 670	0.015 - 35	3.8	2 / 79	0.0045 : 0.005	0.00024 - 0.00032	0.0022
Pesticides/PCBs								
Gamma-BHC/Lindane	15 / 151	0.0083 : 0.21	0.02 - 1.6	0.036				

Table 1-2
Summary of Detected Chemicals for Shallow Subsurface Soil Samples (1-10 ft) and On-Property Shallow Groundwater
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	Shallow Subsurface Soil (1-10 ft bgs) (mg/Kg)				On-Property Shallow Groundwater (mg/L)			
	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
Inorganics								
Aluminum	200 / 200		200 - 15000	4974	82 / 114	0.1 : 0.5	0.015 - 17	0.56
Antimony	12 / 153	0.5 : 20	0.26 - 41	3.1	8 / 81	0.006 : 0.03	0.0015 - 0.0026	0.0034
Arsenic	145 / 185	0.81 : 13	0.5 - 89	4.4	35 / 81	0.001 : 0.05	0.00034 - 0.026	0.0028
Barium	148 / 151	11 : 40	2.2 - 75	15.2	79 / 81	0.01 : 0.042	0.0039 - 0.21	0.032
Beryllium	95 / 153	0.06 : 1.5	0.037 - 0.47	0.31	15 / 81	0.001 : 0.005	0.00019 - 0.0028	0.00060
Cadmium	103 / 265	0.1 : 4.8	0.019 - 7.3	0.35	20 / 81	0.001 : 0.005	0.00014 - 0.0053	0.00062
Calcium	144 / 145	1000 : 1000	150 - 32000	1732	114 / 114		1.6 - 600	138
Chromium	463 / 465	1 : 11	1.8 - 7900	321	23 / 114	0.005 : 0.025	0.00097 - 0.065	0.005
Chromium, Hexavalent	10 / 17	2.1 : 2.4	0.47 - 19.9	4.8	5 / 49	0.001 : 0.001	0.00065 - 0.0016	0.00054
Cobalt	134 / 145	1.5 : 10	0.29 - 14	2.7	32 / 81	0.01 : 0.05	0.0015 - 0.04	0.008
Copper	128 / 153	2 : 23	0.46 - 47	7.1	16 / 81	0.01 : 0.065	0.0019 - 0.33	0.012
Iron	192 / 192		160 - 26000	6144	96 / 118	0.1 : 0.5	0.022 - 35	4.7
Lead	206 / 265	1 : 24	0.73 - 52	5.0	15 / 81	0.005 : 0.025	0.0014 - 0.0088	0.0030
Magnesium	143 / 145	1000 : 1000	63 - 6700	1547	81 / 81		0.11 - 18	3.0
Manganese	145 / 145		5.8 - 340	67	112 / 114	0.01 : 0.01	0.0027 - 7.3	1.0
Mercury	24 / 205	0.04 : 0.22	0.047 - 7	0.10	7 / 81	0.0002 : 0.00034	0.00012 - 0.0003	0.00011
Nickel	138 / 153	1.4 : 8	0.93 - 52	6.4	65 / 114	0.01 : 0.05	0.0012 - 0.045	0.0063
Potassium	143 / 145	1000 : 1000	130 - 2700	696	55 / 81	4 : 8	0.81 - 10	2.7
Silver	23 / 159	0.5 : 13	0.06 - 24	0.92	1 / 81	0.005 : 0.025	0.0027 - 0.0027	0.0029
Sodium	101 / 154	54 : 290	12 - 25600	663	114 / 114		0.85 - 200	20
Tin	54 / 74	5.8 : 7.3	2.1 - 620	18.0	1 / 81	0.05 : 0.25	0.027 - 0.027	0.029
Vanadium	140 / 145	1 : 10	0.89 - 190	11.8	35 / 81	0.01 : 0.02	0.0017 - 0.28	0.013
Zinc	151 / 153	0.6 : 2.5	2.9 - 84	16	42 / 81	0.05 : 0.25	0.0075 - 1.2	0.075
Chloride	28 / 126	17 : 40	1.03 - 170	24	280 / 280		1.1 - 510	54
LAB SPECIFIC CONDUCTANCE (mS/cm)	6 / 6		0.016 - 0.033	0.027	169 / 169		0.065 - 6.8	1.7
Nitrogen, as Ammonia	119 / 159	5.4 : 8.3	3.6 - 4700	145	255 / 279	0.1 : 1	0.16 - 380	57
Sulfate	47 / 125	20 : 80	22 - 285000	4296	276 / 280	2 : 2	2.1 - 2100	481
VPH								
C5-C8 Aliphatics	15 / 53	1.02 : 28	4 - 400	30	24 / 37	0.05 : 0.2	0.62 - 2	0.89
C5-C8 Aliphatics (unadj.)	15 / 53	1.02 : 28	4 - 400	30	25 / 37	0.05 : 0.2	0.16 - 2	0.89
C9-C10 Aromatics	14 / 53	0.34 : 26	3 - 110	9.5	7 / 37	0.05 : 0.5	0.062 - 0.35	0.10
C9-C12 Aliphatics (unadj.)	17 / 53	0.34 : 19	2.7 - 100	10.2	8 / 37	0.05 : 0.5	0.055 - 0.2	0.10
Volatile Petroleum Hydrocarbons, Total	20 / 49	1.8 : 19	3 - 460	42	24 / 37	0.05 : 0.2	0.62 - 2.3	0.92
EPH								
Benzo(ghi)perylene	5 / 27	0.3 : 0.8	0.5 - 0.85	0.29	3 / 79	0.00045 : 0.0005	0.00019 - 0.00028	0.00023
C11-C22 Aromatics	39 / 54	3.3 : 17	3.7 - 4700	449	2 / 4	0.091 : 0.091	0.12 - 0.43	0.16
C11-C22 Aromatics (unadj.)	40 / 54	3.3 : 3.9	3.7 - 4700	522	2 / 4	0.091 : 0.091	0.12 - 0.43	0.16
C19-C36 Aliphatics	24 / 54	3.3 : 36	5.1 - 2900	141	0 / 4	0.091 : 0.095		0.046
C9-C18 Aliphatics	31 / 54	3.3 : 36	5.3 - 380	49	0 / 4	0.091 : 0.095		0.046
Extractable Petroleum Hydrocarbons, Total	41 / 54	3.3 : 3.9	3.7 - 4900	647	2 / 4	0.091 : 0.091	0.12 - 0.43	0.16
Specialty Compounds								
Hydrazine	25 / 69	0.0021 : 0.41	0.00058 - 1.9	0.092	11 / 49	0.0002 : 0.0022	0.000057 - 0.23	0.0073
Acetaldehyde	11 / 45	0.2 : 0.32	0.034 - 0.1	0.096	0 / 49	0.03 : 0.03		0.015
Formaldehyde	43 / 45	0.11 : 0.11	0.087 - 2.1	0.33	0 / 49	0.03 : 0.03		0.015

mg/Kg = milligrams per kilogram

mg/L = milligrams per liter

Shading indicates compound not analyzed for in specified media.

Prepared by / Date: KJC 02/10/12

Checked by / Date: MJM 03/21/12

Table 1-3
Summary of Detected Chemicals for Deep Subsurface Soil (>10 ft) and On-Property Shallow Groundwater
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	Deep Subsurface Soil (10+ ft bgs) (mg/Kg)				On-Property Shallow Groundwater (mg/L)			
	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
Volatile Organics								
2,4,4-Trimethyl-1-pentene	12 / 40	0.004 : 0.2	0.003 - 890	43	40 / 112	0.001 : 0.01	0.00074 - 1.7	0.18
2,4,4-Trimethyl-2-Pentene	12 / 40	0.004 : 0.23	0.002 - 180	7.9	34 / 112	0.001 : 0.01	0.00043 - 0.49	0.050
Carbon disulfide	5 / 37	0.002 : 1.3	0.0014 - 0.52	0.0	9 / 79	0.01 : 0.04	0.00042 - 0.01	0.0049
Semivolatile Organics								
Acetophenone	7 / 76	0.034 : 7.5	0.0041 - 0.053	0.092	0 / 79	0.0045 : 0.005		0.0023
Benzoic Acid	5 / 71	0.065 : 37	0.05 - 0.14	0.86	6 / 44	0.0045 : 0.005	0.00064 - 0.0017	0.0021
Biphenyl	9 / 76	0.034 : 7.5	0.018 - 11	0.26	4 / 79	0.0045 : 0.005	0.00049 - 0.0045	0.0022
Bis(2-Ethylhexyl)phthalate	38 / 88	0.034 : 0.73	0.015 - 10000	166	15 / 112	0.0018 : 0.0052	0.00043 - 0.012	0.0013
Diphenyl ether	16 / 76	0.034 : 7.5	0.014 - 74	1.2	24 / 79	0.0045 : 0.005	0.00052 - 0.14	0.0059
N-Nitrosodiphenylamine	12 / 88	0.034 : 7.5	0.013 - 160	2.8	41 / 112	0.0045 : 0.0051	0.0005 - 0.58	0.065
Phenol	5 / 88	0.034 : 7.5	0.013 - 0.21	0.15	2 / 78	0.0045 : 0.005	0.00067 - 0.0014	0.0022
Inorganics								
Aluminum	83 / 83		570 - 21000	7877	82 / 114	0.1 : 0.5	0.015 - 17	0.56
Arsenic	72 / 77	1 : 2	0.99 - 18	3.4	35 / 81	0.001 : 0.05	0.00034 - 0.026	0.0028
Barium	71 / 71		7.5 - 200	43	79 / 81	0.01 : 0.042	0.0039 - 0.21	0.032
Beryllium	69 / 73	0.4 : 1.5	0.046 - 0.47	0.24	15 / 81	0.001 : 0.005	0.00019 - 0.0028	0.00060
Cadmium	70 / 78	0.3 : 1	0.049 - 1.3	0.27	20 / 81	0.001 : 0.005	0.00014 - 0.0053	0.00062
Calcium	71 / 71		550 - 13000	3012	114 / 114		1.6 - 600	138
Chromium	85 / 85		4.8 - 3400	130	23 / 114	0.005 : 0.025	0.00097 - 0.065	0.005
Chromium, Hexavalent	6 / 6		2.6 - 16	9.1	5 / 49	0.001 : 0.001	0.00065 - 0.0016	0.00054
Cobalt	70 / 71	1.5 : 1.5	1.6 - 26	8.7	32 / 81	0.01 : 0.05	0.0015 - 0.04	0.008
Copper	72 / 73	2 : 2	4 - 66	23	16 / 81	0.01 : 0.065	0.0019 - 0.33	0.012
Iron	81 / 81		840 - 87000	16181	96 / 118	0.1 : 0.5	0.022 - 35	4.7
Lead	72 / 78	0.63 : 10	0.52 - 11	2.3	15 / 81	0.005 : 0.025	0.0014 - 0.0088	0.0030
Magnesium	71 / 71		280 - 15000	5077	81 / 81		0.11 - 18	3.0
Manganese	71 / 71		32 - 460	144	112 / 114	0.01 : 0.01	0.0027 - 7.3	1.0
Nickel	72 / 73	3 : 3	3.2 - 41	14.4	65 / 114	0.01 : 0.05	0.0012 - 0.045	0.0063
Potassium	71 / 71		320 - 12000	2193	55 / 81	4 : 8	0.81 - 10	2.7
Silver	37 / 73	0.53 : 3.1	0.055 - 8.4	1.3	1 / 81	0.005 : 0.025	0.0027 - 0.0027	0.0029
Sodium	72 / 79	110 : 150	22 - 1000	214	114 / 114		0.85 - 200	20
Tin	68 / 69	13 : 13	1.8 - 190	30	1 / 81	0.05 : 0.25	0.027 - 0.027	0.029
Vanadium	71 / 71		2.8 - 71	27	35 / 81	0.01 : 0.02	0.0017 - 0.28	0.013
Zinc	73 / 73		4.4 - 66	23	42 / 81	0.05 : 0.25	0.0075 - 1.2	0.075
Chloride	14 / 79	15 : 40	12.2 - 62.8	14.4	280 / 280		1.1 - 510	54
Nitrogen, as Ammonia	72 / 79	4.7 : 7.9	7 - 510	121	255 / 279	0.1 : 1	0.16 - 380	57
pH	12 / 12		4.29 - 8.13	6.5	31 / 31		5.45 - 6.87	6.3
Sulfate	31 / 78	33 : 49	8.12 - 13400	316	276 / 280	2 : 2	2.1 - 2100	481
VPH								
C5-C8 Aliphatics	5 / 21	1.09 : 23	6.4 - 1400	108	24 / 37	0.05 : 0.2	0.62 - 2	0.89
C5-C8 Aliphatics (unadj.)	5 / 21	1.09 : 23	6.4 - 1400	108	25 / 37	0.05 : 0.2	0.16 - 2	0.89
C9-C10 Aromatics	5 / 21	0.362 : 24	3.2 - 61	8.0	7 / 37	0.05 : 0.5	0.062 - 0.35	0.10
Volatile Petroleum Hydrocarbons, Total	6 / 18	2 : 3	9.6 - 1400	133	24 / 37	0.05 : 0.2	0.62 - 2.3	0.92
EPH								
C11-C22 Aromatics	16 / 26	3.6 : 3.9	4.6 - 1700	248	2 / 4	0.091 : 0.091	0.12 - 0.43	0.16
C19-C36 Aliphatics	12 / 26	3.4 : 3.9	4 - 3200	134	0 / 4	0.091 : 0.095		0.046
C9-C18 Aliphatics	10 / 26	3.4 : 72	4.5 - 520	32	0 / 4	0.091 : 0.095		0.046

Table 1-3
Summary of Detected Chemicals for Deep Subsurface Soil (>10 ft) and On-Property Shallow Groundwater
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	Deep Subsurface Soil (10+ ft bgs) (mg/Kg)				On-Property Shallow Groundwater (mg/L)			
	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
Specialty Compounds								
Hydrazine	5 / 8	0.0021 : 0.3	0.00058 - 0.0031	0.020	11 / 49	0.0002 : 0.00022	0.000057 - 0.23	0.0073
Acetaldehyde	15 / 43	0.2 : 0.25	0.033 - 0.16	0.090	0 / 49	0.03 : 0.03		0.015
Formaldehyde	43 / 43		0.093 - 1	0.35	0 / 49	0.03 : 0.03		0.015

mg/Kg = milligrams per kilogram

mg/L = milligrams per liter

Prepared by / Date: KJC 02/10/12

Checked by / Date: MJM 03/21/12

Table 1-4
Locations of On-Property Shallow Groundwater Locations Sampled Since 2007
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

On-Property Shallow Groundwater Locations
B-03
B-07-A
B-10
ECS-6
GW-13
GW-14
GW-16
GW-16R
GW-17S
GW-201S
GW-202S
GW-21S
GW-28S
GW-29S
GW-301
GW-302
GW-303
GW-304
GW-305
GW-306
GW-307
GW-308
GW-31S
GW-32S
GW-34SR
GW-35S
GW-3S
GW-50S
GW-51S
GW-52S
GW-53S
GW-54S
GW-55S
GW-56S
GW-6S
GW-78S
GW-79S
GW-CA1
PZ-16RR
PZ-17RR
PZ-18
PZ-18R
PZ-24
PZ-25
SL-1S
SL-2
SL-3
SL-5
SL-6

Table 2-1
Summary of Detected Chemicals for On-Property Shallow Groundwater and Surface (0-1 ft) and Shallow Subsurface (1-10 ft) Soil
Preliminary Remedial Investigation Report RTC
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	On-Property Shallow Groundwater (mg/L)				Surface Soil (0-1 ft) (mg/Kg)				Shallow Subsurface Soil (1-10 ft) (mg/Kg)			
	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
Volatile Organics (mg/L)												
1,1-Dichloroethane	6 / 79	0.001 : 0.004	0.00031 - 0.001	0.00056	1 / 201	0.0022 : 1	0.001 - 0.001	0.030	0 / 281	0.002 : 11		0.058
2,4,4-Trimethyl-1-pentene	40 / 112	0.001 : 0.01	0.00074 - 1.7	0.18	7 / 196	0.0044 : 0.79	0.002 - 2.1	0.049	73 / 263	1.3E-06 : 0.28	0.002 - 1200	11.6
2,4,4-Trimethyl-2-pentene	34 / 112	0.001 : 0.01	0.00043 - 0.49	0.050	6 / 197	0.0044 : 0.79	0.0056 - 0.61	0.032	62 / 260	1.3E-06 : 0.28	0.001 - 310	3.4
Carbon disulfide	9 / 79	0.01 : 0.04	0.00042 - 0.01	0.0049	0 / 160	0.0022 : 0.16		0.0052	7 / 188	0.0021 : 11	0.001 - 0.013	0.053
Semivolatile Organics (mg/L)												
Benzoic Acid	6 / 44	0.0045 : 0.005	0.00064 - 0.0017	0.0021	30 / 190	0.17 : 180	0.025 - 34	3.8	0 / 2	1.65 : 3.63		1.3
Bis(2-Ethylhexyl)phthalate	15 / 112	0.0018 : 0.0052	0.00043 - 0.012	0.0013	168 / 220	0.034 : 9.1	0.011 - 5500	33	256 / 396	0.034 : 1.4	0.012 - 8600	120
Diphenyl ether	24 / 79	0.0045 : 0.005	0.00052 - 0.14	0.0059	19 / 129	0.033 : 17	0.011 - 1.7	0.20	7 / 92	0.033 : 37	0.03 - 3.8	0.44
Diphenylmethanone	17 / 79	0.0045 : 0.005	0.00049 - 0.011	0.0023	0 / 128	0.033 : 17		0.16	0 / 92	0.033 : 37		0.34
Indeno(1,2,3-cd)pyrene	5 / 79	0.00045 : 0.0005	0.00012 - 0.00028	0.00022	42 / 216	0.033 : 36	0.011 - 14	0.79	8 / 396	0.033 : 670	0.012 - 10	3.7
N-Nitrosodimethylamine	38 / 81	0.0000019 : 0.0045	0.0000006 - 0.0013	0.000092	0 / 131	0.0051 : 4		0.067	0 / 119	0.005 : 37		0.25
N-Nitrosodiphenylamine	41 / 112	0.0045 : 0.0051	0.0005 - 0.58	0.065	38 / 218	0.033 : 36	0.012 - 32	0.77	73 / 396	0.033 : 400	0.011 - 3400	23
Metals, Total (mg/L)												
Aluminum	82 / 114	0.1 : 0.5	0.015 - 17	0.56	158 / 158		640 - 59000	6868	200 / 200		200 - 15000	4974
Antimony	8 / 81	0.006 : 0.03	0.0015 - 0.0026	0.0034	9 / 144	0.53 : 20	0.28 - 79	2.2	12 / 153	0.5 : 20	0.26 - 41	3.1
Arsenic	35 / 81	0.001 : 0.05	0.00034 - 0.026	0.0028	161 / 178	0.9 : 37	1.3 - 56	8.2	145 / 185	0.81 : 13	0.5 - 89	4.4
Barium	79 / 81	0.01 : 0.042	0.0039 - 0.21	0.032	164 / 164		3.4 - 130	24	148 / 151	11 : 40	2.2 - 75	15.2
Beryllium	15 / 81	0.001 : 0.005	0.00019 - 0.0028	0.00060	119 / 145	0.18 : 1.5	0.029 - 4	0.33	95 / 153	0.06 : 1.5	0.037 - 0.47	0.31
Cadmium	20 / 81	0.001 : 0.005	0.00014 - 0.0053	0.00062	121 / 185	0.18 : 4	0.026 - 5.8	0.38	103 / 265	0.1 : 4.8	0.019 - 7.3	0.35
Calcium	114 / 114		1.6 - 600	138	146 / 146		68 - 35000	3511	144 / 145	1000 : 1000	150 - 32000	1732
Chromium	23 / 114	0.005 : 0.025	0.00097 - 0.065	0.005	0 / 1	0.05 : 0.05		0.025	9 / 10	0.05 : 0.05	0.063 - 0.84	0.31
Chromium, Hexavalent	5 / 49	0.001 : 0.001	0.00065 - 0.0016	0.00054	13 / 34	1.1 : 110	0.41 - 1100	43	10 / 17	2.1 : 2.4	0.47 - 19.9	4.8
Cobalt	32 / 81	0.01 : 0.05	0.0015 - 0.04	0.008	143 / 146	0.24 : 5.4	0.16 - 45	3.9	134 / 145	1.5 : 10	0.29 - 14	2.7
Copper	16 / 81	0.01 : 0.065	0.0019 - 0.33	0.012	146 / 146		0.94 - 190	14.9	128 / 153	2 : 23	0.46 - 47	7.1
Iron	96 / 118	0.1 : 0.5	0.022 - 35	4.7	158 / 158		81 - 100000	9618	192 / 192		160 - 26000	6144
Lead	15 / 81	0.005 : 0.025	0.0014 - 0.0088	0.0030	182 / 186	5 : 11	1.1 - 210	23	206 / 265	1 : 24	0.73 - 52	5.0
Magnesium	81 / 81		0.11 - 18	3.0	146 / 146		24 - 6000	1437	143 / 145	1000 : 1000	63 - 6700	1547
Manganese	112 / 114	0.01 : 0.01	0.0027 - 7.3	1.0	146 / 146		2.8 - 970	89	145 / 145		5.8 - 340	67
Mercury	7 / 81	0.0002 : 0.00034	0.00012 - 0.0003	0.00011	68 / 176	0.04 : 0.76	0.01 - 3.1	0.16	24 / 205	0.04 : 0.22	0.047 - 7	0.10
Nickel	65 / 114	0.01 : 0.05	0.0012 - 0.045	0.0063	145 / 146	5 : 5	0.66 - 76	10.1	138 / 153	1.4 : 8	0.93 - 52	6.4
Potassium	55 / 81	4 : 8	0.81 - 10	2.7	140 / 146	620 : 2100	46.3 - 3400	766	143 / 145	1000 : 1000	130 - 2700	696
Sodium	114 / 114		0.85 - 200	20	90 / 144	110 : 1100	15 - 2300	133	101 / 154	54 : 290	12 - 25600	663
Vanadium	35 / 81	0.01 : 0.02	0.0017 - 0.28	0.013	146 / 146		3.6 - 240	19.5	140 / 145	1 : 10	0.89 - 190	11.8
Zinc	42 / 81	0.05 : 0.25	0.0075 - 1.2	0.075	141 / 146	11 : 27	1.2 - 650	38	151 / 153	0.6 : 2.5	2.9 - 84	16.3
Metals, Filtered (mg/L)												
Aluminum	61 / 191	0.1 : 0.5	0.0024 - 24	0.2	158 / 158		640 - 59000	6868	200 / 200		200 - 15000	4974
Calcium	25 / 25		5.3 - 560	277	146 / 146		68 - 35000	3511	144 / 145	1000 : 1000	150 - 32000	1732
Chromium	158 / 191	0.005 : 0.025	0.00052 - 0.14	0.009	0 / 1	0.05 : 0.05		0.025	9 / 10	0.05 : 0.05	0.063 - 0.84	0.31
Iron	41 / 58	0.1 : 0.1	0.017 - 30	4.5	158 / 158		81 - 100000	9618	192 / 192		160 - 26000	6144
Manganese	25 / 25		0.0034 - 4.5	2.1	146 / 146		2.8 - 970	89	145 / 145		5.8 - 340	67
Nickel	16 / 25	0.01 : 0.05	0.0015 - 0.014	0.0052	145 / 146	5 : 5	0.66 - 76	10.1	138 / 153	1.4 : 8	0.93 - 52	6.4
Sodium	25 / 25		2.6 - 46	16.6	90 / 144	110 : 1100	15 - 2300	133	101 / 154	54 : 290	12 - 25600	663
Inorganics (mg/L)												
Bicarbonate Alkalinity, as CaCO ₃	33 / 33		7.3 - 310	164								
Bromide	23 / 81	0.1 : 0.1	0.1 - 0.69	0.11			</td					

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	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples	Frequency of Detection	Range of Reporting Limits for Non Detect Concentrations	Range of Detected Concentrations	Average of All Samples
VPH (mg/L)												
Ethyl benzene	6 / 33	0.001 : 0.025	0.004 - 0.0052	0.0038	0 / 201	0.0022 : 1		0.030	14 / 281	0.002 : 11	0.002 - 6.7	0.11
Xylene, o	10 / 33	0.001 : 0.025	0.0052 - 0.01	0.0050	0 / 171	0.0022 : 1		0.035	5 / 207	0.002 : 11	0.042 - 0.53	0.082
C5-C8 Aliphatics	24 / 37	0.05 : 0.2	0.62 - 2	0.89	0 / 25	2 : 4		1.4	15 / 53	1.02 : 28	4 - 400	30.3
C5-C8 Aliphatics (unadj.)	25 / 37	0.05 : 0.2	0.16 - 2	0.89	0 / 25	2 : 4		1.4	15 / 53	1.02 : 28	4 - 400	30.3
C9-C10 Aromatics	7 / 37	0.05 : 0.5	0.062 - 0.35	0.10	1 / 25	2 : 4	3.4 - 3.4	1.4	14 / 53	0.34 : 26	3 - 110	9.5
C9-C12 Aliphatics (unadj.)	8 / 37	0.05 : 0.5	0.055 - 0.2	0.10	0 / 25	2 : 4		1.4	17 / 53	0.34 : 19	2.7 - 100	10.2
Volatile Petroleum Hydrocarbons, Total	24 / 37	0.05 : 0.2	0.62 - 2.3	0.92	1 / 25	2 : 4	3.4 - 3.4	1.4	20 / 49	1.8 : 19	3 - 460	42
EPH (mg/L)												
Site Specific Compounds (mg/L)												
Hydrazine	11 / 49	0.0002 : 0.00022	0.000057 - 0.23	0.0073	16 / 58	0.002 : 0.28	0.00062 - 0.27	0.022	25 / 69	0.0021 : 0.41	0.00058 - 1.9	0.092
4,4'-Isopropylidenediphenol	9 / 49	0.00094 : 0.001	0.00043 - 0.0043	0.00061								
4-Nonylphenol (Tech.)	18 / 49	0.0047 : 0.0052	0.0019 - 0.038	0.0063								
Kempore (Azodicarbonamide)	5 / 49	1 : 1	0.32 - 5.2	0.63								

mg/L = milligram per liter

mg/Kg = milligram per kilogram

mS/cm = millisiemen per centimeter

Shading indicates compound not analyzed for in specified media.

Prepared by / Date: KJC 03/19/12

Checked by / Date: MJM 03/21/12